

CLAIMS

What is claimed is:

- 1 1. A system comprising:
2 an optical signal source; and
3 an integrated circuit operatively coupled to the optical signal source, the
4 integrated circuit including:
5 a substrate, and
6 a plurality of regions formed in the substrate and having refractive
7 indices different from that of the substrate, the plurality of regions and intervening
8 areas of the substrate forming a grating, the grating having a plurality of grating
9 periods with substantially constant pitch, wherein each grating period of the plurality
10 of grating periods includes a region of the plurality of regions, the plurality of regions
11 having regions of at least two different widths.
- 1 2. The system of claim 1, wherein for each grating period of the plurality of
2 grating periods, a grating period adjacent to that grating period has a region having a
3 width is different from the width of that grating period's region.
- 1 3. The system of claim 1, wherein the plurality of regions are filled trenches
2 formed in the substrate, the material filling the trenches being different from the
3 material of the substrate.
- 1 4. The system of claim 1, wherein the plurality of regions is formed from
2 polysilicon and the substrate is formed from crystalline silicon.

1 5. The system of claim 1, wherein the plurality of regions are formed proximate
2 to a buried insulator layer of a silicon-on-insulator (SOI) wafer.

1 6. The system of claim 1, further comprising forming a cladding layer on the
2 substrate and the plurality of regions.

1 7. The system of claim 1, wherein a rib waveguide is formed in the substrate,
2 the rib waveguide containing the plurality of regions.

1 8. The system of claim 1, wherein the substrate and the plurality of regions form
2 a Bragg grating.

1 9. The apparatus of claim 8 wherein the waveguide Bragg grating has less than
2 1000 grating periods with an enhanced extinction ratio of more than 10 dB over non-
3 apodized waveguide Bragg grating.

1 10. The system of claim 9, wherein the waveguide Bragg grating's Bragg
2 wavelength is electronically tunable.

1 11. The system of claim 9, wherein the waveguide Bragg grating's Bragg
2 wavelength is thermally tunable.

1

1 12. A method, comprising:
2 propagating an optical beam through a Xth region of a plurality of regions, the
3 Xth region having a first width, wherein the plurality of regions are formed in a
4 substrate, the substrate having a refractive index different from the refractive indices
5 of the plurality of regions, and wherein the plurality of regions and intervening areas

6 of the substrate form a grating, the grating having a plurality of grating periods of
 7 substantially constant pitch, each grating period of the plurality of grating periods
 8 including a region of the plurality of regions, the Xth region being contained in a Xth
 9 grating period of the plurality of grating periods; and
 10 propagating the optical beam through a Yth region of the plurality of regions,
 11 the Yth region having a second width different from the first width and contained in a
 12 Yth grating period of the plurality of grating periods, the Yth grating period being
 13 adjacent to the Xth grating period.

1 13. The method of claim 12, further comprising propagating the optical beam
 2 through a Zth region of the plurality of regions, the Zth region having a third width
 3 different from the second width and contained in a Zth grating period of the plurality
 4 of grating periods, the Zth grating period being adjacent to the second grating
 5 period, wherein the second width is greater than both the first and third widths.

1 14. The method of claim 12, wherein the plurality of regions are polysilicon-filled
 2 trenches formed in the substrate, the being formed from crystalline silicon.